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finer his attitude to the relational theory. He observes (pp. 156-163) that our errors are largely mere omissions and not creations; that even illusions "deceive no well-informed person"; and that "were men sufficiently well-informed, and were such experiences sufficiently common, there would in no case be the shadow of an illusion," which seems to mean only that if there were no illusions there would be no illusions. The fact remains that illusions, hallucinations and dreams occur; and the question is whether (as some neo-realists hold) the content presented in these can be said to exist in real, objective space, at the time of its presence in consciousness, and whether there is any justification for, or meaning in, calling it "independent" of consciousness. To this question, with which the other new realists so laboriously deal, Fullerton, so far as I can see, gives no entirely plain answer; and it is for this reason that the relation of his realism to theirs remains, at the most significant point of all, obscure. I take it, however, that he does *not* view consciousness as an absolutely functionless relation, and that he would reject the paradox of the objectivity of the illusory.

Assuming this to be his meaning, Fullerton must be understood to regard some content of perception as purely mental, or subjective, and some as wholly objective and independent. The further question remains: Where, and by what criterion, shall we draw the line between the two? Patient and subtle as are Fullerton's reasonings upon this point, I do not find them altogether clear or convincing. His desire, evidently, is to make the realm of the subjective a very little one; hence his exclusion from it even of the secondary qualities, and his apparent reduction of it to the hallucinatory and imaginary merely. But his reasons for drawing the line where he does appear to me blurred through a failure to give and adhere to a single, clear definition of "external" and "objective." In a general way one gathers that (pp. 111-115) things and qualities are external, in the proper sense, when they do not involve a "relation to our sense-organs," when I "can account for them

without referring to the relation of my body to them." But this throws little light upon the subject. How am I to know when data which are obviously mediated through my sense-organs involve no relation thereto? When (as in the case of color) specific variations in my sense-organs are uniformly accompanied by specific variations in the qualities which appear in consciousness, are not the latter, in accordance with the definition given, "internal" or mental? But in that case, what becomes of the proof of the externality of color-qualities? Does Fullerton, then, mean that anything is external which without contradiction can be *conceived* as existing without involving the idea of my body? If this is what is meant, one must still object that there are familiar arguments which seem to show that most of the perceived qualities which one object presents to different percipients *are* reciprocally contradictory, so long as the qualities are regarded as inhering independently in the object by itself, and not as functions of its diverse relations to those percipients. These points not being satisfactorily dealt with, Fullerton's realistic construction fails of complete definiteness of outline and consequently of cogency.

A noteworthy part of the book is the interpretation of Kant as the "first great modern realist" (Chaps. V.-VII.); this view is not new, but it has never, perhaps, been so forcibly presented. The most brilliant chapters in the volume are the critical ones. The passages on absolute idealism and on pragmatism are delightfully witty, yet eminently searching, examples of philosophic satire. The latter, I think, is less than just to some aspects of pragmatism; but the former (Chaps. XIII.-XV.) is a masterpiece in its kind.

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*Handbuch der Entomologie.* Herausgegeben von Professor Dr. CHR. SCHRÖDER. Jena, Gustav Fischer. 1913.

For the past twenty years Kolbe's "Einführung" has been the best known German text-book on entomology. Now Dr. Schröder

(editor of the *Zeitschr. f. wissenschaftl. Insektenbiologie*) has undertaken to issue a more extensive work. It is significant of the increasing specialization in entomology that this new work is not the product of one author, but of eleven. It is divided into three parts: Volume I. is on the Anatomy, Embryology, Morphology, and Metamorphosis, and is prepared by Dr. C. Börner, Professor P. Deegener, Dr. J. Gross, and Dr. O. Prochnow. Volume II. will treat of the Habits, Distribution, Economic, and Experimental Entomology, and will be written by Dr. Schröder, Dr. K. Eckstein, Dr. O. Heineck, Dr. K. Holdhaus, Dr. L. Reh, and Dr. H. Rübsaamen. Volume III. will consider Paleontomology, Phylogeny, and Systematics, and is to be prepared by Dr. A. Handlirsch. The portions now issued (three parts of Volume I.) are almost wholly by Dr. Deegener. Chapter I. is on the skin (including color, scales, skin-glands, scent-glands, wax-glands, etc.) with an appendix on the sound organs; Chapter II. treats the nervous system (especially the larger ganglia); Chapter III., the sense-organs, largely histological. In this chapter are various minor errors; the great family Capsidæ is not mentioned under Heteroptera as being without ocelli, the Panorpatae are stated to have three ocelli, although on a previous page the genus *Boreus* is correctly stated to be without ocelli, and the various cases of ocelli in Coleoptera are unmentioned. The various sense-organs of unknown purpose (pseudocelli, abdominal organs of moths, post-antennal organs) are considered, as well as the supposed correlation or rather complementary development between the eyes and the antennæ. Chapter IV. considers the alimentary canal and its appendages (salivary glands, malpighian glands, anal glands) and is very complete, as Dr. Deegener is particularly interested in this matter. Chapter V. is on the respiratory organs, and is rather one-sided, most attention being given to respiration in aquatic insects and in parasites. Chapter VI. treats of the circulation, blood, heart, the specific heat of insects, fat-bodies, light-organs (rather briefly) and oenocytes.

Chapter VII. relates to the endoskeleton and muscles. The muscular system of the imago of *Dystiscus* (as given by Bauer) is taken as typical, with but little comparison to other insects or larvæ. Only a brief summary is given of the endoskeleton, and brief treatment of muscular contraction, attachments of muscles, and muscular power of insects.

The most useful feature of the work is the long bibliographies at the end of each chapter. Although not by any means complete (American references often lacking) these lists furnish references that are difficult to secure but essential to any one studying these subjects. In fact, so useful is this new "Handbuch" that we hope a group of our entomologists will plan an American work on the same general lines.

NATHAN BANKS

#### TRIALS AND TROPISMS

##### I.

SOME years ago<sup>1</sup> I attempted an analysis of the facts grouped under the familiar but apparently confusing term "tropism theory." In the light of my experience I found myself seriously questioning the validity of a view that had just been published by Jennings in his well-known book, "The Behavior of the Lower Organisms." The issue was essentially this: whether tropisms are developed through selection from overproduced movements by means of the method of trial, or whether they are primary responses in the same sense that these overproduced movements are, and not, therefore, products of a process of selection as suggested.

Jennings soon found opportunity to reply to my objections as well as to those of other critics, notably Loeb and Parker. His reply, however, does not appear to have convinced them, for they have both taken issue since with his conception of the nature of tropic reactions. And though, up to the present, I have not thought it either necessary or desirable to add my own misgivings to a rapidly

<sup>1</sup>"The Method of Trial and the Tropism Hypothesis," *SCIENCE*, N. S., XXVI., pp. 313-23, September 6, 1907.